

Low-Voltage Panel Motor Control Center

Specification

This Standard replaces and cancels its previous revision.

The CONTEC - Authoring Subcommittee provides guidance on the interpretation of this Standard when questions arise regarding its contents. The Department of PETROBRAS that uses this Standard is responsible for adopting and applying the sections, subsections and enumerates thereof.

Technical Requirement: A provision established as the most adequate and which shall be used strictly in accordance with this Standard. If a decision is taken not to follow the requirement ("non-conformity" to this Standard) it shall be based on well-founded economic and management reasons, and be approved and registered by the Department of PETROBRAS that uses this Standard. It is characterized by imperative nature.

Recommended Practice: A provision that may be adopted under the conditions of this Standard, but which admits (and draws attention to) the possibility of there being a more adequate alternative (not written in this Standard) to the particular application. The alternative adopted shall be approved and registered by the Department of PETROBRAS that uses this Standard. It is characterized by verbs of a nonmandatory nature. It is indicated by the expression: **[Recommended Practice]**.

Copies of the registered "non-conformities" to this Standard that may contribute to the improvement thereof shall be submitted to the CONTEC - Authoring Subcommittee.

Proposed revisions to this Standard shall be submitted to the CONTEC - Authoring Subcommittee, indicating the alphanumeric identification and revision of the Standard, the section, subsection and enumerate to be revised, the proposed text, and technical/economic justification for revision. The proposals are evaluated during the work for alteration of this Standard.

"This Standard is exclusive property of Petróleo Brasileiro S. A. - PETROBRAS, internal application and PETROBRAS Subsidiaries and shall be used by its suppliers of goods and services under contracts or similar under the conditions established in Bidding, Contract, Agreement or similar.

The use of this Standard by other companies / organizations / government agencies and individuals is the sole responsibility of the users.."

CONTEC

Comissão de Normalização
Técnica

SC - 06

Electricity

Introduction

PETROBRAS Technical Standards are prepared by Working Groups - WG (consisting specialized of Technical Collaborators from Company and its Subsidiaries), are commented by Company Units and its Subsidiaries, are approved by the Authoring Subcommittees - SCs (consisting of technicians from the same specialty, representing the various Company Units and its Subsidiaries), and ratified by the Executive Nucleus (consisting of representatives of the Company Units and its Subsidiaries). A PETROBRAS Technical Standard is subject to revision at any time by its Authoring Subcommittee and shall be reviewed every 5 years to be revalidated, revised or cancelled. PETROBRAS Technical Standards are prepared in accordance with PETROBRAS Technical Standard N-1. For complete information about PETROBRAS Technical Standards see PETROBRAS Technical Standards Catalog.

Foreword

This Standard is the English version (issued in 11/2013) of PETROBRAS N-314 REV. C 12/2012. In case of doubt, the Portuguese version, which is the valid document for all intents and purposes, shall be used.

1 Scope

1.1 This Standard establishes minimum requirements for purchasing a low-voltage panel Motor Control Center (CCM), with rated voltages up to 1 000 V, for feeding service and motor control in PETROBRAS' facilities.

1.2 This Standard is not applied to low voltage panel for installation in potentially explosive atmospheres.

1.3 This Standard applies to procedures beginning from its issue date.

1.4 This Standard contains Technical Requirements and Recommended Practices.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document applies.

PETROBRAS [N-898](#) - Símbolos Gráficos e Designações para Diagramas Elétricos (Graphical Symbols and Designations for Electrical Diagrams);

PETROBRAS [N-1219](#) - Cores (Colors);

ABNT [NBR 5410](#) - Instalações Elétricas de Baixa Tensão (Low Voltage Electrical Installations);

ABNT [NBR IEC 60439-1](#) - Conjuntos de Manobra e Controle de Baixa Tensão Parte 1: Conjuntos com Ensaio de tipo Totalmente Testados (TTA) e Conjuntos com Ensaio de Tipo Parcialmente Testados (PTTA) (Low-Voltage Switchgear and Controlgear Assemblies - Part 1: Type-Tested [TTA] and Partially Type-Tested [PTTA] Assemblies);

ABNT [NBR IEC 60529](#) - Graus de Proteção para Invólucros de Equipamentos Elétricos (código IP) (Degrees of Protection Provided by Enclosures (IP Code));

ABNT [NBR IEC 60947-2](#) - Dispositivos de Manobra e Comando de Baixa Tensão - Parte 2: Disjuntores (Low-voltage Switchgear and Controlgear - Part 2: Circuit-Breakers);

ABNT [NBR IEC 60947-4-1](#) - Dispositivo de Manobra e Controle de Baixa Tensão Parte 4-1: Contatores e Partidas de Motores - Contatores e Partidas de Motores Eletromecânicos (Low-Voltage Switchgear and Controlgear Part 4-1: Contactors and Motor-Starters - Electromechanical Contactors and Motor-Starters);

IEC [60073](#) - Basic and Safety Principles for Man-Machine Interface, Marking and Identification - Coding Principles for Indicators and Actuators;

IEC [60076-6](#) - Power Transformers - Part 6: Reactors;

IEC [60092-201](#) - Electrical Installations in Ships - Part 201: System Design - General Fourth Edition;

IEC [60092-302](#) - Electrical Installations in Ships - Part 302: Low-Voltage Switchgear and Controlgear Assemblies Fourth Edition;

IEC [60417](#) Database Snapshots - Graphical Symbols for Use on Equipment;

IEC 60445 - Basic and Safety Principles for Man-machine Interface, Marking and Identification - Identification of Equipment Terminals, Conductor Terminations and Conductors;

IEC 60533 - Electrical and Electronic Installations in Ships - Electromagnetic Compatibility;

IEC 60909 - Short-Circuit Current Calculation in Three-Phase A.C. Systems;

IEC 61000-5-2 - Electromagnetic Compatibility (EMC) - Part 5: Installation and Mitigation Guidelines - Section 2: Earthing and Cabling;

IEC 61086-1 - Coatings for Loaded Printed wire Boards (Conformal Coatings) - Part 1: Definitions, Classification and General Requirements;

IEC 61086-2 - Coatings for Loaded Printed wire Boards (Conformal Coatings) - Part 2: Methods of Test;

IEC 61892-3 - Mobile and Fixed Offshore Units - Electrical Installations - Part 3: Equipment;

IEC TR 61641 - Enclosed Low Voltage Switchgear and Controlgear Assemblies - Guide for Testing Under Conditions of Arcing Due to Internal Fault;

ISO 3864-2 - Graphical Symbols Safety Colours and Safety Signs Part 2: Design Principles for Product Safety Labels;

ISO 7010 - Graphical Symbols Safety Colours and Safety Signs Safety Signs Used in Workplaces and Public Area;

ASTM F855 - Standard Specifications for Temporary Protective Grounds to Be Used on De-Energized Electric Power Lines and Equipment;

ASTM F1166 - Standard Practice for Human Engineering Design for Marine Systems, Equipment and Facilities;

ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi;

ASTM E1934 - Standard Guide for Examining Electrical and Mechanical Equipment with Infrared Thermography;

IEEE C 57.16 - Standard Requirements, Terminology, and Test Code for Dry-Type Air-Core Series-Connected Reactors.

NOTE For documents referred in this Standard and for which only the Portuguese version is available, the PETROBRAS department that uses this Standard should be consulted for any information required for the specific application.

3 Terms and Definitions

For purposes of this Standard, the terms and definitions indicated in items 3.1 to 3.14 are adopted.

3.1

compartment

closed section or subsection, except for some openings required for interconnection, control or ventilation

3.2

future compartment

closed section or subsection, except for some openings required for interconnection, control or ventilation, with structural components and electrical connectors prepared for future installation of functional unit. It shall have all extraction and locking devices, and it only does not have the switch, control, measuring, signaling and protecting devices

3.3**assembly (low-voltage switchgear and controlgear assembly)**

combination of one or more low-voltage switch, control, measuring, signaling, protecting or regulation devices and equipment items, fully mounted, being all electrical and mechanical inner interconnections and structural parts responsibility of the manufacturer

3.4**EMC (Electromagnetic Compatibility)**

Ability of an equipment item or system work properly in its electromagnetic ambient without introducing unbearable electromagnetic disturbances

3.5**IT network**

connection system in which all live parts are isolated from ground or where a feeding point is grounded through impedance. Installation masses are grounded in the same feeding ground electrode, if any, or in a separated ground electrode

3.6**FPSO**

Floating Production Storage and Off-Loading Unit

3.7**FSO**

Floating Storage and Off-Loading Unit

3.8**mounting plate**

plate designed to support many components, suitable for installation in an assembly

3.9**section**

construction unit of an assembly between two successive vertical splits

3.10**tropicalization**

industrial treatment process against degradation of electronic and mechanical components, aimed at ensuring their proper functional performance when subjected to environmental conditions of tropical areas

3.11**functional nit**

part of an assembly, covering all electrical, mechanical and electronic elements that contribute to performance of the same function

3.12**spare functional unit**

functional unit with all electromechanical and electronic components installed to perform a specific function

3.13**package unit**

equipment or part of installation supplied with all internals installed and interconnected, so as to allow its perfect operation, depending only on the supplying of external utilities (electric power, compressed air, etc.)

4 General Conditions

4.1 Any item not sufficiently covered by ABNT Standards shall meet international standards IEC and ISO. The impossibility of meeting any item shall be submitted to PETROBRAS' approval during the proposal presentation stage.

4.2 The application of IEC [60092-201](#), IEC [60092-302](#) and IEC [61892-3](#) is limited to offshore facilities. For installation in vessels, (FPSO and FSO), the IEC [60092-201](#) and IEC [60092-302](#) have priority over the others.

4.3 Specific characteristics of the panel are indicated on the Data Sheet in Annex A, which is an integral part of the Material Requisition (RM), alongside this Standard.

4.4 Blank items of the Data Sheet in Annex A shall be filled in by the supplier, which shall return it to PETROBRAS, duly certified. The supplier is responsible for all information contained in the given Data Sheet.

4.5 When there are divergences between the Data Sheet in Annex A and this Standard, the information contained in the former prevails.

4.6 Any alternative presented by the proponent shall be clearly indicated in the proposal, in a specific item called "DEVIATIONS".

5 Construction Characteristics

5.1 The panel and its components shall be designed and fabricated in accordance with recommendations of the standards indicated on Section 2 of this Standard and on the Data Sheet in Annex A. It shall have electrical interlock and wiring interconnection availability between its sections and interlock prediction between remotely installed devices.

5.2 Unless otherwise indicated in Data Sheet in Annex A, the panels shall be Type-Tested (TTA), in accordance with ABNT [NBR IEC 60439-1](#).

5.3 Classification of Assemblies With Relation to ABNT [NBR IEC 60439-1](#)

5.3.1 Panels shall be multi-string-type metallic assemblies.

5.3.2 Unless otherwise indicated in Data Sheet in Annex A, panels shall be suitable for sheltered installation.

5.3.3 Unless otherwise indicated in Data Sheet in Annex A, panels shall be of fixed assembly type.

5.3.4 Protection Degree

5.3.4.1 The protection degree shall follow at least the Table 1, according to ABNT [NBR IEC 60529](#).

Table 1 - Protection Degree

Installation	Onshore	Offshore
Sheltered in panel room	IP21	IP22
Sheltered in engine room	IP31	IP32
Covered outdoors	IP43	IP56SW
Uncovered outdoors	IP54SW	IP56SW
NOTE The suffix W, when used, means equipment suitable to operation in salted, hot, humid atmosphere with presence of hydrocarbons.		

5.3.4.2 The protection degree between compartments adjacent to panel shall be at least IP21B, according to ABNT [NBR IEC 60529](#).

5.3.4.3 The protection degree shall be kept with functional units in test and isolated positions, and during transfer from a position to another.

5.3.5 Panels shall be made of extractable parts, with the following positions:

- a) connected;
- b) test;
- c) extracted (isolated);
- d) removed.

NOTE Each functional unit shall have a separated extractable part. Extractable parts shall slide on rails or guides.

5.3.6 The protection against electrical shock through direct contact with protective barriers, enclosures and busbar insulations shall be ensured.

5.3.7 The protection against electrical shock through indirect contact shall be ensured by protective circuits (ground busbar).

5.3.8 The assembly shall be designed and organized so as it allows inspections and similar operations made by certified personnel when the assembly is on duty and under voltage..

5.3.9 Unless otherwise indicated in Data Sheet in Annex A, panels shall be separated in accordance with inner separation 4b..

5.3.10 Electrical connections from functional units to main inlet circuit, main outlet circuit and auxiliary circuits shall be of extractable type (WWW type).

5.3.11 Unless otherwise indicated in Data Sheet in Annex A, panels shall be suitable for installation in electromagnetic compatibility environment level 2, according to ABNT [NBR IEC 60439-1](#).

5.4 Structure

5.4.1 The panel shall be made of self-sustaining steel plates, with structural gauge profiles in accordance with the manufacturer's standard, with expansion possibility on both ends.

5.4.2 The panel shall consist of standardized and independent vertical sections, where equipment is to be housed. Each vertical section shall be subdivided at least in the following separated compartments:

- a) busbar;
- b) switchgears;
- c) outlet cables.

5.4.3 Each section shall have, on the front part, doors with hinges. The doors shall have electrical continuity with the panel structure through flexible copper wire. Unless otherwise indicated in Data Sheet in Annex A, the rear access shall be done through a door with hinges, fitted with a lock.

5.4.4 All doors with hinges shall have a locking device when in open position.

5.4.5 For panels installed in floating offshore units, the front and rear parts shall be provided with handrails made of insulation material in the entire panel length.

5.4.6 The panel shall have holes for placement of devices to fix the panel to a base, as well as pad eyes for lifting and handling. The devices shall be supplied by the panel manufacturer.

5.4.7 Panels shall be designed to resist thermal efforts due to bearable short-duration rated current (I_{cw}) for 1 s. Panels shall be designed to resist mechanical efforts due to bearable peak rated current (I_{pk}). The values of such currents shall be informed in the Data Sheet in Annex A.

5.4.8 The panel shall be fitted with a document holder on its outside in order to file and keep technical documents relevant to panel.

5.4.9 The bearable impulse rated voltage of equipment (1.2/50 μ s) at 2 000 m shall be at least dimensioned using overvoltage class IV and rated operating voltage for ground of 1 000 Vca RMS, according to ABNT [NBR IEC 60439-1](#).

5.4.10 The minimum distance of air insulation is 14 mm, considering non-homogeneous field, pollution level 3, according to ABNT [NBR IEC 60439-1](#), and bearable rated impulse voltage of equipment as per 5.4.9.

5.4.11 The minimum flow distance is 16 mm, considering pollution level 3, material group III A, according to ABNT [NBR IEC 60439-1](#), and rated insulation voltage of equipment of 1 000 V.

5.4.12 When required in Data Sheet in Annex A, the panel shall be certified to provide protection to personnel under internal arc conditions, in accordance with IEC [TR 61641](#), complying at least with criteria 1 to 5 of test assessment. The allowable current under arc condition ($I_{p\ arc}$) for test shall be the bearable short-duration rated current (I_{cw}) or more, and the allowable arc duration (t_{arc}) shall be at least 0,3 s.

5.5 Corrosion Supportability

5.5.1 The panel shall be resistant to corrosion caused by moisture and characteristic atmosphere of installation site, as indicated on the Data Sheet in Annex A. If previously approved by PETROBRAS, the use of the manufacturer's treatment system and standard painting is allowed.

5.5.2 The final finish color shall comply with the indicated in Data Sheet in Annex A.

5.5.3 The final color of inner faces of doors and mounting plates shall comply with code 1867 of PETROBRAS [N-1219](#) (Munsell 2.5 YR 6/14).

5.5.4 For offshore installations or those subjected to aggressive environment, all material used in hinges, locks, bolts, locking devices, structural fixing elements and nameplates shall have anticorrosive protection, such as double-chrome coating or use of stainless steel AISI 300 series.

5.5.5 Circuits printed in electronic modules of functional units shall be treated for protection against aggressive and salted environments (tropicalization) and corrosive gases (for example, gases containing sulfur or chlorine), consisting of, at least, application of Class 2 reinforced protective, in accordance with IEC [61086-1](#) and [61086-2](#), and fungiproof, in accordance to ASTM [G21](#). The manufacturer shall inform in its proposal the processes used for this protection, subjected to PETROBRAS' approval.

5.6 Interlocks

5.6.1 If the extraction of drawer with closed doors is required in Data Sheet in Annex A, the extraction up to test position and insertion shall only be performed through a lever, with closed door and the circuit-breaker in the "off" position.

NOTE If an arc monitoring device is required in Data Sheet in Annex A, only criteria 1 and 2 of IEC [TR 61641](#) shall be met, and the others shall be skipped. In this case, the arch energy shall not be above 8 cal/cm².

5.6.2 All drawers shall allow the use of a padlock, locking them in the "off" position. In the "on" position, it shall be impossible to open the compartment door.

5.6.3 There shall be signaling in the front part of the "connected", "test" and "extracted" positions of functional unit cabinet, through a mechanical device.

5.6.4 Main busbar terminals shall be automatically covered by a packer made of insulating material when the switchgear is extracted, preventing the access to parties with voltage.

5.7 Erection

5.7.1 All main components of functional units intended for feeding similar equipment (same type and power), such as: busbars, circuit-breakers, contactors, protective relays, etc. shall have the same specification.

5.7.2 The CCM inlet string shall have a service input socket 2 P+T of 127 Vca or 220 Vca, feed by the same external source of heating resistors of panels. This socket is intended for connection of a notebook or handheld device, used to set up the IEDs.

5.7.3 If required in Data Sheet in Annex A, the panels shall be designed so as to allow inspection by infrared thermography with energized panels. It may be provided the use of "special displays" that allow the thermographic inspection without the previous shutdown of system or the built-in and continuous thermal monitoring with optical-electronic sensing technology.

5.7.4 Panels shall allow access to their busbars and insertion clamps by the rear end, with possibility of access for maintenance in front and rear faces.

5.7.5 When installed in floating platforms and vessels (FPSO and FSO), the panels shall be suitable for operation subjected to variations of slope (static and dynamic), vibrations and accelerations specified by the Classification Society.

5.7.6 When installed in floating platforms and vessels (FPSO and FSO), panels shall be designed to meet the minimum requirements of emission, immunity and performance criteria regarding EMC, established by IEC [60533](#).

5.7.7 The use category of functional units for feeding of transformers shall be AC-6a, as per ABNT [NBR IEC 60947-4-1](#).

5.7.8 Unless otherwise indicated in Data Sheet in Annex A, the use category of motor-starters shall be AC-3 as per ABNT [NBR IEC 60947-4-1](#).

5.7.9 In "test" position, the force contacts of functional units shall meet the minimum flow distance and insulation requirements, in accordance with ABNT [NBR IEC 60439-1](#).

5.7.10 For functional units with frequency converters and soft starters, temperature rise tests of these cabinets shall be performed considering the temperature at rated load with closed door.

5.8 Grounding

5.8.1 All metallic parts making up the panel, not provided for current conduction, shall be connected to its ground busbar, using electrical connecting jumpers with cross section, as per Table 3A of ABNT [NBR IEC 60439-1](#). This busbar shall stay in the panel lower inner part, running all over its length and supplied with suitable connectors, not welded type, for naked copper cables, strung 70 mm² gage for onshore installations and 95 mm² for offshore installations, on each one of its ends.

5.8.2 When intelligent electronic instruments and devices are provided, each compartment shall have a terminal block ruler or an electronic reference bar, isolated from the structure.

5.8.3 Grounding and equipotentialization of electronic reference terminals of intelligent electronic instruments and devices shall meet the requirements of IEC 61000-5-2.

5.8.4 Temporary protective grounding facilities shall be provided through a standardized device, as per ASTM F 855.

5.8.5 The manufacturer shall supply, with the panel, 1 temporary protective grounding kit containing at least 1 grounding rod clamp, 3 bar clamps and 1 cable, dimensioned as per ASTM F 855.

5.9 Safety and Product Identification and Graphic Signaling

5.9.1 The panel shall be fitted with a series AISI 300 stainless steel nameplate containing the data provided in ABNT NBR IEC 60439-1.

5.9.2 The panel shall be fitted with a supplementary series AISI 300 stainless steel nameplate containing at least the following data:

- a) Petróleo Brasileiro S.A. - PETROBRAS;
- b) PETROBRAS' department name;
- c) Project name;
- d) Panel number (TAG);
- e) RM number;
- f) Purchase Order number;
- h) as an alternative to f) the contract number, in cases of purchase built in global price contract (Turn Key, Lump Sum, etc.).

5.9.3 The panel shall be fitted with a supplementary series AISI 300 stainless steel identification plate according to the figure below:

	
	RISK OF ELECTRIC SHOCK AND ARC USE THE RECOMMENDED EPI
VOLTAGE LEVEL: _____ V	
SAFE DISTANCE APPROACH FOR ACTIVITIES SUBJECT TO ARC: _____	
ENERGY INCIDENT: _____ (cal/cm ²)	

Figure 1 - Additional Nameplate

5.9.4 Each compartment shall have a black plastic nameplate and engraving in white letters on its outer front face. Equipment number shall be placed in the first line; in the second line (and third if necessary) equipment function shall be placed. These data are indicated in the single line diagram. In spare and empty compartments (future installation) plates shall be supplied without engraving. Each compartment shall have the identification of its functional unit in the rear part and fixed and moving front parts.

5.9.5 The front and rear faces shall have nameplate of sections.

5.9.6 All components of compartments or functional units shall be identified with nameplates fixed on the mounting plate and on the component.

5.9.7 All equipment items and devices shall be internally identified by tags or nameplates with the same name used in the functional diagram.

5.9.8 In addition to the main and supplementary nameplates, the electric panel shall have their compartments signaled with text and graphic plates with instructions, cautions, warnings and hazard alerts, according to requirements for nameplates of standard ASTM F 1166 and for symbols of IEC 60417 Database Snapshots, ISO 7010 and ISO 3864-2.

5.9.9 The text on every plate and nameplate on panel shall be engraved in Portuguese.

6 Description of Component Parts

Equipment listed in the next items, when required in the Data Sheet in Annex A and unless indicated otherwise, shall be supplied in accordance with the specifications described in 6.1 to 6.8.

6.1 Circuit Breakers in Molded Casing

6.1.1 Circuit-breakers shall be fabricated and tested as per ABNT NBR IEC 60947-2 and comply with the characteristics specified in Data Sheet in Annex A.

6.1.2 Circuit Breakers shall be three-pole, manual command by lever, "molded casing" type.

6.1.3 For non-motoric loads, each breaker shall have a direct action thermomagnetic trigger in each phase.

6.1.4 Breaker command shall be made through a lever, outside and with no need for opening the compartment door. It may only be opened with breaker off, and it is not possible to close the breaker when the compartment door is open.

6.1.5 There shall be an indication on the command lever of the on and off position, and there shall be the possibility of placing a padlock for this position.

6.1.6 Breakers shall be provided with devices neutralizing ambient temperature effects on its triggers.

6.1.7 Opening mechanism shall be "free-opening" type.

6.1.8 Circuit-breakers from functional units for feeding engines or other loads that do not require selectivity shall have use category A, as per ABNT NBR IEC 60947-2.

6.1.9 Breakers shall be fabricated with provided maintenance, in accordance with ABNT NBR IEC 60947-2.

6.1.10 Breakers shall be specified for continuous rated load regime, in accordance with [NBR IEC 60947-2](#).

6.2 Contactors

6.2.1 When the use of contactors is specified, the coordination with short-circuit protection devices shall be type 2, as defined in IEC [60947-4-1](#). The manufacturer shall attach to the technical proposal a certificate of test for each model of functional unit, issued by a recognized laboratory, proving the type of coordination.

6.2.2 Contactor coils shall withstand a 30% rated voltage drop without disconnection of the contacts occurring

6.2.3 The feeding voltage of contactor coils, when used, shall be obtained from auxiliary individual transformers, as per functional diagrams.

6.3 Transformers for Instruments and Auxiliary Transformers

6.3.1 Potential and auxiliary transformers shall be dry and extractable.

6.3.2 Potential and auxiliary transformers shall be protected by fuses or circuit-breaker, with proper breaking capacity on the primary side, and by breakers on the secondary side. Fuses shall be integrated in the extractable assembly, so as the fuses may be removed with no voltage in their terminals.

6.3.3 Current transformers shall be dry. The manufacturer shall provide ways to allow the placement of current transformer secondary in short-circuit when it is required to remove its load.

6.4 Instruments, Protective Relays, Devices and Signaling

6.4.1 Unless otherwise indicated in the Data Sheet in Annex A, functional units of panel shall be provided with intelligent and integrated electronic devices and instruments, interconnected with data communication network.

6.4.2 Each intelligent electronic device shall have a fixed address code to communicate with the safety system and external control. Intelligent electronic devices of the CCM in this specification shall be interlocked so as to prevent the local or remote operation of a functional unit inserted in a place different than the one assigned to this functional unit.

6.4.3 Protective relays of functional units shall meet the protection standards defined in Data Sheet in Annex A and in single line diagrams attached to this Data Sheet.

6.4.4 Software for configuration of digital relays, multi-meters, transducers, transducers, programmable controllers, etc. shall be part of the scope of supply, and shall be supplied with no additional burden, in its most complete version. Software shall be compatible with Microsoft Windows® operational system.

6.4.5 If indicated in the Data Sheet in Annex A, the panel shall be fitted with an electric arc monitoring device with activating scheme, so as to de-energize the panel instantaneously.